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THE ADMINISTRATION OF A BASE HOSPITAL

BY

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The activities of the military establishment are divided in time of war, into a service of the theater of operations and a service of the interior or home territory; the theater of operations being again divided into: The zone of the advance and the zone of the line of communications.

The ambulance company and the field hospital operate in the zone of the advance, being at all times in touch with the troops they serve.

The base hospital, however, scarcely enters the theatre of operations, being found on the line of communications, usually as its name indicates, at the base of this line. Occasionally, however, when the base is far removed from the army in the zone of the advance, supplementary base hospitals may be established at suitable points along the line of communications. The number to be established is determined on the basis of the number of troops to be served and the percentage of sick and wounded, which may reasonably be anticipated in one particular campaign.

An old rule for the determination of casualties requires an estimation on a basis of 10% casualties in active campaign. Of this number 20% will be killed outright, the remainder will require the attention of the Medical Department. In addition to an estimate of casualties from wounds it is necessary to estimate the casualties from disease, which will depend upon the severity of the service, the healthfulness of the country in which the campaign is to be conducted; and whether or not the troops are well seasoned.

For an infantry division of some 20,000 men four field hospitals to shelter 216 patients each; two evacuation hospitals of 432 beds each; and one base hospital of 500 beds are provided by existing regulations. This makes a provision for a total of 2428 patients. It is to be remembered, however, that field hospitals have no beds in the usual acceptance of the term, when hospital beds are spoken of.

The sick and wounded coming into these hospitals are cared for on pallets of straw separated from the ground by rubber blankets.

As has been stated their function is to provide temporary shelter and care for the sick and wounded until the sanitary service of the line of communications can take charge of them, prompt evacuation being necessary in order that they may keep in touch with the troops to which they belong.

The evacuation hospitals are intended to replace field hospitals, and for this reason it is necessary that all serious cases requiring protracted treatment and those permanently incapacitated be sent further to the rear to the base hospitals.

The base hospital is the link between the evacuation hospital and the general hospital in the home territory.

The outflow of patients from the base hospital to the general hospital must keep pace with the influx from the sanitary units on the line of communications, otherwise the service of the base and evacuation hospitals and finally that of the field sanitary units will become clogged and ineffective.

All hospitals in the theater of operations except the base hospitals are provided with canvas shelters which they may use when suitable buildings are not available. No tentage is provided for the base hospital and it must be established in some civil hospital or other suitable buildings which may be available, or lacking these, temporary buildings will be constructed after plans on file in the Surgeon General's office.

These buildings are of simple construction and can be erected by ordinary builders with material which can be purchased in any market.

In the interest of simplicity a simple type has been adopted for all purposes, and the various buildings differ only in their interior arrangements. They are all one story frame structures with walls and ceilings finished in tongued and grooved beaded boards, heated by stoves and roofed with corrugated iron.

One story pavilions are preferred because of greater simplicity of construction and greater facility of heating and ventilating, and in case of fire the lesser risk to patients. Each ward consists of a building 120 ft. long, 26 ft. wide with ceiling 12 feet high, lighted by ten windows on each side.

When the plans are closely followed an annex is provided for each ward connected by a passage way to be used as a lavatory.

In the end of the ward nearest the annex is a room on either side. One for special diets, the other for office and linen room. The ward proper is 106 feet long and accommodates 26 beds, each patient having 106 feet of floor space and 1272 feet of cubic space.

The wards are heated by stoves (depending somewhat upon the climate), in others ventilating shafts of galvanized iron conduct fresh air under the floor to the stoves which are then surrounded by galvanized

iron jackets. For the removal of vitiated air ventilation shafts are provided through the ceiling and roof surrounding the smoke pipes.

The general arrangement and grouping of the pavilions vary greatly.

The wards may be set like divergent rays on the outer side of a covered way, shaped like a horse shoe, or they may be located on each side of a covered way on two sides of a square or rectangle.

The chief objects to be attained in determining the general plan are to give each ward a maximum of space, light, and sunshine; secure accessibility to all parts and convenience of service; and to provide open attractive grounds for the use of convalescents.

The cost of these pavilions is from $1800 to $2500 each, depending upon the local prices of lumber and labor.

When a base hospital is completed according to these plans it will have in addition to ward buildings, an operating pavilion, nurses quarters, quarters for enlisted men and officers, store rooms, wards for contagious diseases suitably located, an administration building, in fact, all of the departments found in large civil hospitals.

The equipment of base hospitals is similar to that of any large modern hospital. It has well equipped operating rooms, with sterilizing outfits heated by gas or oil. Modern X-Ray machines are installed and in the wards white enameled hospital beds with hair mattresses are provided.

The personnel of a base hospital consists of twenty medical officers, one hundred and fifty-two enlisted attendants which includes in addition two ward attendants, cooks and cooks' assistants, operating room attendants, laboratory assistants, dispensary clerks, men employed in store rooms, etc. Forty-six female nurses complete the personnel.

The senior medical officer on duty is termed the Commanding officer.

He is responsible for the proper care of patients, for the discipline, instruction, equipment and general efficiency of his command.

Much of the work done in a large hospital is necessarily of an administrative character. Medical officers are therefore required to assume certain of these administrative duties in addition to their professional work.

For example, one officer will have charge of the correspondence and the various duty rosters, and will communicate the orders of the commanding officer to all persons on duty in the hospital.

One medical officer will act as Registrar, having charge of medical and surgical records, requiring that careful histories be prepared and preserved in order that all claims for pensions may be adjudicated with justice to the Government and the individual.

Another officer is made accountable for all government property used in the hospital which pertains to the quartermaster, ordnance and medical departments.

He also has to do with means of transportation, disinfection and refrigeration plants, and with shops and store rooms.

One medical officer acts as mess officer. He has charge of all diets served to patients and of the mess, of the attendants on duty under the direction of the commanding officer; he spends the hospital fund which accrues from the commutation of the sick in hospital and from other sources.

The enlisted men of the medical department on duty form a detachment and it is necessary that a medical officer be given command of them; being responsible for the proper keeping of their accounts and records and for their discipline, instruction, equipment and quartering.

Civilian physicians called to serve in time of war would probably find this administration work connected with base hospitals irksome and disagreeable. For this reason it would probably be desirable that this work should be done for a time, at least, by medical officers who are instructed in it, the physicians called to the colors from civil life being employed in strictly professional work with which they would be perfectly familiar.

The professional service of the hospital is usually divided into a medical and surgical section with one medical officer in charge of each.

These chiefs of services are responsible to the commanding officer for the proper administration of their sections. They will assign ward officers to duty and consult and advise them when necessary.

Other officers having professional duties in a base hospital are:

One as Roentgoenologist.

One in charge of eye, ear, nose, and throat work.

One as Pathologist, in charge of the chemical, bacteriological and pathological laboratory.

One or more Dental surgeons.

It is stated that in time of war the American National Red Cross Secretary is to be depended upon to furnish 25% of the officers, 25% of the ward attendants and 75% of the female nurses. It seems probable that a much larger percentage than this must be furnished from outside sources. In fact, in the last two years, the Red Cross has organized base hospital units in some of our large cities, the equipment to be used having been purchased for some of these units and is stored and is in readiness for immediate use.

It is planned that the personnel for these base hospitals be drawn complete from the civil hospital which organized the unit.

The value of this measure of medical preparedness will doubtless soon be thoroughly tested.

THE AMBULANCE COMPANY

BY

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(Read before Arizona Medical Association Meeting, Douglas, Arizona, April 18th, 1917.)

The ambulance company owes its inception, as do practically all the modern methods for the evacuation of the wounded, to the genius of Jonathan Letterman, Medical Director of the Army of the Potomac under McClellan during the Civil War. The deplorable condition of the wounded following the first battle of Bull Run lead to earnest efforts on the part of the Medical Department to devise efficient methods for their prompt evacuation and care following action. Letterman devised and, after many difficulties and much opposition on the part of certain authorities, secured the adoption of a comprehensive system, which with few modifications is now in use by the sanitary service of all modern armies.

The functions of the ambulance company are three-fold: first, to furnish ambulance service in camp and on the march; second, to transport the wounded from the regimental first aid stations, and where necessary from the firing line itself to the field hospitals, and, third, to render such aid as will enable the slightly wounded to return to the firing line and the more seriously wounded to be transported to the rear.

Under the third heading the care of the slightly wounded is mentioned first advisedly. The primary function of armies is to win battles and the paramount duty of the sanitary service is to aid the combatant troops in this function by instituting and carrying out such sanitary measures as will prevent the depletion of their ranks by disease, by securing the prompt return of the sick and wounded to their duties, and by the prompt evacuation of the non-effectives to the rear that the combatant forces may not have their movements embarrassed and their morale impaired by their presence. The knowledge that prompt and efficient care and transportation will be his lot in case he is wounded means much in sustaining the morale of the fighting man. The disabled man is, at best, a temporary loss to the forces in action, and his care, while appealing to our humanitarian instincts as medical men, must await that of the slightly wounded man who may be returned immediately to his place in the line.

The infantry division, which is the great administrative and tactical unit of modern armies, consists in our army of three brigades of three regiments of infantry each, a brigade of two regiments of field artillery, a regiment of cavalry, a battalion each of engineers and signal troops, a

sanitary train of four ambulance companies and three field hospitals, and ammunition, engineer and supply trains. It aggregates in round numbers 23,000 men of all arms and branches. The cavalry division has three ambulance companies.

The personnel of an ambulance company consists of one captain, four lieutenants, two sergeants first class, seven sergeants, one horseshoer, one mechanic, one saddler, one farrier, two cooks and sixty-eight privates first class and privates. These are organized into a bearer detachment, a pack detachment, an ambulance detachment, and a wagon detachment. The bearer detachment is further subdivided into four platoons of four little squads each and the ambulance detachment into three platoons of four ambulances each.

The companies of a division are under the command and supervision of an officer of the rank of major, known as the Director of Ambulance Companies. He, in turn, receives his orders from the Division Surgeon. His relations to the companies are, in general, similar to those of a major of the line to his battalion.

The transportation in the case of an animal drawn company comprises four pack mules to carry the dressing station equipment, twelve ambulances, and three escort wagons. The first wagon is known as the combat wagon and carries additional supplies for the dressing station, a reserve of surgical dressings to replenish those used by the dressing and regimental first aid stations and, on the march, 20 litters for the use of the bearer detachment. The second wagon is the baggage wagon. It carries the company baggage, supplies and equipment for the horseshoer, farrier, saddler, and mechanic, the 50 lbs. of baggage allowed to each officer, and, when practicable, the blanket rolls of the enlisted men. The third or ration wagon carries two day's field and one day's reserve rations for the men and two day's grain rations for the animals.

The organization and transportation of a motor company is still in the experimental stage but the transportation at present assigned comprises one light touring car for the officers, twelve motor ambulances, one spare parts car, and two 1½ ton motor trucks. The question of the method of transporting the dressing station equipment is yet undecided. My personal belief is that it should be carried by four motorcycles with side car attachment similar to those in use for package delivery, the contents of each to be packed in four knapsacks in order that it may be transported on the backs of the men when the terrain or the conditions are of such a character as to preclude the approach of the motorcycles to the site of the dressing station. Recommendation to this effect has been made to the Surgeon General.

On the march when not in the presence of the enemy, the ambulances are distributed amongst the regiments of the division and transport those who are unable to march. In camp, when practicable, the ambulances re-

join their companies and are parked with the grouped sanitary train. They also furnish the ambulance service for the camp. The wagons carrying the equipment for the camp infirmaries are ordinarily attached to them.

In the presence of the enemy one ambulance company will ordinarily march in the rear of the advance guard while the remaining three will be grouped with the remainder of the sanitary train.

When the combat is imminent the dressing station parties, comprising the bearer and pack detachments, move up in rear of the combatant troops to which they may be assigned. Ordinarily one company is attached to each brigade. The trains, consisting of the ambulance and wagon detachments, are placed immediately in rear of the ammunition trains.

As the action develops, orders are issued by the Division Surgeon through the Director of Ambulance Companies or, when authorized or in emergency, by the latter officer for the establishment of as many dressing stations as are required.

The dressing stations are established as far forward as possible without unduly exposing them to the fire of the enemy. Their location will vary with the character of the terrain and the facilities for shelter, cover, water and evacuation of the wounded. For purposes of discussion it may be assumed that ordinarily they will be located within a mile from the firing line.

The equipment of a dressing station is carried on four pack mules. It consists of: a medical and surgical chest, containing instruments and supplies for emergency operations, a few medicines in the form of tablets and a liberal supply of morphine and stimulants; a box of miscellaneous supplies, such as Red Cross guidons for marking the route from the front to the dressing station, lanterns for use by bearers in searching for the wounded at night, denatured alcohol for stoves, lanterns and candles for lighting the dressing station, basins, etc.; two boxes of surgical supplies, containing first aid packets, compressed bandages, gauze and cotton, splints etc.; and two food boxes, containing beef extract, tinned soup, condensed milk, cocoa, tea, coffee, etc., a bucket, alcohol stove and large stirring spoon; buckets; bags for carrying water; and two tent flies for use when no shelter is available. As before noted, the combat wagon carries a large reserve of supplies and a liberal number of oil lanterns as well as a flag pole with national and Red Cross flags for marking the station.

On its establishment, the bearer detachment with their litters and personal equipment for rendering first aid are sent forward under the direction of a medical officer to clear the wounded from the first aid stations, established by the regimental sanitary detachments, and, when necessary, from the front itself. They are instructed to mark the route to the dressing station with the Red Cross guidons for the guidance of the slightly wounded, to direct the ambulant patients to it and to transport those unable to walk. They will apply first aid and attach diagnosis tags to those

who have not already received attention. The dead are also tagged for purposes of record and to avoid loss of time in further examination by subsequent parties. The bearer detachment is ordinarily divided into as many sections as there are aid stations, each under the command of a non-commissioned officer.

On its establishment, the dressing station is divided into the following departments: receiving and forwarding, slightly wounded, seriously wounded, dispensary and kitchen.

It is well to establish the receiving and forwarding department a short distance in advance of the other departments in order that the necessary sorting of the wounded may be accomplished before they reach the other departments and disorganize them. For the same reason the department for slightly wounded, if possible, should be placed in advance of that for seriously wounded. If this be not done the latter department will be flooded with the slightly wounded who always arrive before those requiring transportation.

All wounded pass through the receiving and forwarding department where a rigorous division and selection of cases must be carried out. This sorting continues through all establishments of the sanitary service to the end that the slightly wounded may be returned to the front with the least practicable delay and the seriously wounded receive as prompt treatment and evacuation as passible. Those able to return to the front will receive treatment and be directed forward as soon as possible, a notation to that effect being made on their diagnosis tags, while the ambulant cases unable to do so will be dressed, gathered in parties, and sent to the rear under the direction of the highest officer or soldier amongst them. They will generally be directed to the station for the slightly wounded. A memorandum of the number and disposition of the cases will be kept at the receiving and forwarding department and the required list of sick and wounded made out.

The seriously wounded are treated in the department for that purpose. Emergency operations only will be performed, such as ligations, tracheotomies, etc. The character of the treatment given will depend upon the number of the wounded and other circumstances but is ordinarily only of such a character as will prepare the wounded for further transportation. A liberal use of morphine and administration of hot liquid food is ordinarily indicated.

The ambulance train and wagons, which have been left behind, are usually held in the vicinity of the nearest field hospital, some four or five miles in the rear. These should be sent for and brought up at the earliest possible moment to clear the dressing station. Under modern battle conditions, in which the enemy covers every avenue of approach from the rear with a hail of shells to prevent the bringing forward of

supplies, this may be delayed for long periods and ordinarily will be possible only under cover of darkness.

Under favorable conditions, such as a retreat of the enemy, it may be possible for the ambulances to clear directly from the field of battle, thus obviating the transportation by litter bearers. Under these circumstances, the dressing station and, if possible, the field hospital may be established at that point. It should be the practice, as far as possible, to transport the sanitary formation to the patient rather than the reverse.

The army ambulance furnishes accommodation for eight sitting or four recumbent patients. The train of an ambulance company will thus furnish accommodations for 96 sitting or 48 recumbent patients at each trip. When the ambulance accommodations are insufficient for the casualities application may be made to the division commander for the use of all empty transportation returning from the front. Little dependence can be placed on this mode of conveyance, however, as it will be impossible to divert them in the slightest from their course back to their points of ammunition and other supply. As soon as a field hospital is established, its seven wagons or trucks may be placed at the disposal of the ambulance train. Civilian transportation will be impressed and gathered into trains prior to or during an engagement and be used to supplement the ambulance train.

When time permits, a list of the wounded should be turned over to the officer in charge of the train. A special notation of those wounded likely to require attention or die en route to the field hospital should be made on this list. If impracticable to furnish this list at the dressing station, an endeavor should be made to prepare it en route and a copy turned over to the field hospital.

Each ambulance carries a supply of surgical dressings and food of the same character as those at the dressing station. These are intended for the use of the wounded en route should there be delay or a long trip but in emergency they may be turned over to the dressing station.

In transportation it is important that the wounded should be handled as little as possible. With this end in view no patient should be removed from a litter after having once been placed on it, before reaching the field hospital. Delay and discomfort to the patient will be reduced by turning the litter into the field hospital and securing an empty one for it from that formation. The litter is placed on supports and used as a dressing and operating table at the dressing station. Each ambulance carries four litters as part of its equipment and there are twenty additional litters on the combat wagon for the use of the bearer detachment, making a total of sixty-eight litters for each company.

The weakest link in the chain of transportation is that between the aid station and the dressing station. The present organization of our army provides for only sixteen litter squads of two bearers each. This is entirely insufficient and is far below the quota allowed in other armies.

In practical work it is found to be impracticable for two men to carry a patient on a litter for any distance. To remedy this defect an increase in personnel of the ambulance company to 150 men in the case of an animal drawn company and 125 in a motor company is under consideration. The latter number has been fixed as the maximum personnel that can be transported in the motor vehicles on the march.

To give an approximate idea of the work devolving on an ambulance company in combat the following figures based on the experience of previous wars may be cited. These figures are the ones ordinarily employed in the solution of sanitary problems and are subject to wide modification in actual practice. The experience of the present war has tended to increase the ratio of dead to wounded and of seriously wounded to slightly wounded as the result of the great increase in use and efficiency of artillery fire.

Approximate strength of a brigade: 6000.

10 per cent casualties	600
20 per cent killed	120
8 per cent seriously wounded	48
32 per cent wounded requiring transportation	192
40 per cent wounded able to walk	240
Total wounded	480

It will thus be seen that a tremendous and in certain cases an overwhelming amount of work will devolve upon the personnel and transportation of an ambulance company following a battle. To provide for emergencies, the sanitary personnel of unengaged troops may be temporarily assigned to assist that of the ambulance companies actively engaged.

No attempt can be made in the brief space of this paper to cover the multiplicity of details covering the administration, supply and training of a company. The outlines of these are laid down in the Army Regulations, Manual of the Medical Department and other official and unofficial publications but can be mastered only by practical experience with a company. It is to be feared that in the organization and training of the new armies that many of our confreres in civil life, who will now join us, will have a stony path to follow before they and their companies will be able to render that service to the wounded and to the Nation which is their due. We can find encouragement and guidance, however, in the example of our ally, Great Britain, who has successfully overcome in this war the same difficulties which now confront us and much can be gained by a careful study of the papers now available concerning the work of our brothers-in-arms, the Royal Army Medical Corps, as well as those by our own officers. In this connection I most earnestly urge that you give your time to a study of the official publications mentioned, The Military Surgeon, the foreign correspondence in the medical journals and, if available, The Journal of the Royal Army Medical Corps.

CLINICAL FEATURES OF LABYRINTHITIS

BY

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(Read before the El Paso County Medical Society, May 7th, 1917.)

Whenever a patient states that he is dizzy, or has dizzy spells, the physician should at once think of disease of the vestibular apparatus and should satisfy himself that the dizziness is or is not directly from that source. At times, the neurologist or the otologist may be needed to decide the question, but as a rule, a few well directed questions should determine the necessity of further investigation.

First: Inquire if the patient has at any time had a discharge from the ears, and whether or not it entirely healed.

Second: Inquire carefully as to any specific history. (Syphilis and tuberculosis.)

Third: Look for signs of facial paralysis, deafness or even internal strabismus. Test the equilibrium and the usual deep reflexes.

If your findings are negative all the way through, you may rest reasonably certain that the dizziness comes indirectly from some other source. However, any suspicion that the trouble originates in the vestibular apparatus, including the semi-circular canals, the nerve trunk, or in the basilar centers, must be thoroughly investigated.

The importance of a discharging ear in this connection must not be underestimated. A discharging ear with partial or total deafness, may be just as dangerous as one associated with vertigo, but as we always have varying degrees of deafness with an otorrhea, we are not prone to consider the deafness alone so seriously.

The association of vertigo with acute middle ear disease does not give us great concern, as the disturbance usually passes away after a good paracentesis has been made, or at least, after the acute mastoid operation has been performed. Vertigo with acute middle ear infection may be caused from a banking up of the secretions against the oval and round window, or it may be from a more or less diffuse inflammatory swelling in the wall of the labyrinth, causing pressure or irritation to the nerve endings in the labyrinth. As stated, the relief of pressure and the subsidence of the active process usually results in restoration of the normal condition.

It is not unusual to meet with vertigo and spontaneous nystagmus following the radical mastoid operation, without previous labyrinth symptoms, all due to irritation to the labyrinth wall, while operating. This also usually subsides in a few days. At no time, in the cases under consideration, does the hearing power entirely disappear, that is, destruction to the nerve endings in the labyrinth but seldom occurs here.

Now, let us consider vertigo with a chronically suppurating middle ear. The patient states that he has had a discharge for years, at times less than others. There is a bad odor and more or less deafness all the time. He may or may not give a history of having had mastoid disease. Suddenly, he began having dizzy spells, everything would turn around in front of him. Perhaps for a few moments or even hours, he could not continue his work. His stomach troubled him and he felt very sick. These spells became more frequent and finally he consults the oculist who finds the following well known conditions: No pain or tenderness over the mastoid; scanty, thick or dried pus in the canal; drum either gone, or there is a large perforation through which a whitish material can be seen, and upon examination proves to be a cholesteatoma, extending into the attic and antrum or, perhaps, in place of the cholesteatoma, only slight indications of pus can be made out coming from the attic. The hearing may be very poor, or absent. The eyes are examined for voluntary nystagmus which if present, shows a short, quick movement of the eyeballs toward the well ear, when the patient looks straight forward. The vestibular reaction is then tested by syringing the ear out with preferably cold water at about 70 degrees Fahr. If the nerve endings are still active, the patient will feel dizzy when about a pint of water has slowly flowed against the wall of the middle ear. At the same time, an active nystagmus can be seen, the quick movements being toward the well ear, as the patient looks ahead. In case the nerve endings have been seriously damaged or destroyed, of course, there is but little or no vertigo or nystagmus from the stimulating test. Revolving the patient in a chair, and applying the galvanic current, may also be employed to test the vestibular nerve endings.

Experience has taught us the necessity of a routine examination in all chronically discharging ears. It is only by making the tests that we can intelligently deal with labyrinthitis, which may appear as a complication without gross symptoms. We have learned that the absolute loss of hearing associated with a discharging ear and with but little or no response to the caloric tests, should not only have a radical mastoid operation, but also drainage of the labyrinth itself, as the majority of these cases end with brain abscess or meningitis. We know when even a slight amount of hearing is obtained with or without response to the caloric test, it is not advisable to enter the labyrinth at once, as the process is more or less circumscribed and not necessarily dangerous, although in all such suppur-

ating ear cases with vertigo and spontaneous nystagmus, the radical mastoid operation should be made, in order to give Nature a better chance to heal the damaged structures.

In all patients, with impaired hearing and vertigo, whether he has an otorrhea or not, a thorough investigation as to syphilis should be made, as this disease is responsible for many of our labyrinth cases. Although, in syphilis the symptoms may be identical to the symptoms in non-specific cases, the treatment is radically different.

Vertigo and nystagmus, the prime symptoms of vestibular disturbance, can not be gone into in this brief article, but attention is called to the importance of making a very complete examination as to the sources of the symptoms, whenever met with. They constitute a very efficient sentry system for the brain. The disturbance may be the onset of some grave nervous disease, it may be a brain tumor located in any region, it may be a circulatory disease, it may be an irritation to the various nerve endings for the eye, the ear, the stomach, or to any other organ, or, it may be a toxine, being liberated from some remote part of the body.

I have directed attention to the vestibular irritation other than of labyrinthian source, in order that the association of labyrinth disease may never be lost sight of in dealing with patients exhibiting either vertigo, nausea and vomiting, disturbance of equilibrium, deafness, obscure persistent headaches, or even a general weakenss and an irritability without any apparent cause.

The importance of a comprehensive knowledge of labyrinth disease, may be illustrated by the following cases recently seen in private practice:

Case 1: April 3rd, 1917. J. T., age 24, consulted me about his ears, which had been discharging pus for six months. He did not have much pain before or after rupture of the drums; no headache, no fever, no mastoid symptoms. Was very deaf in the right ear and at times, had dizzy spells. Was sick at his stomach much of the time, could not eat or sleep well. Lost weight and recently could not attend to his work. Examination showed both of the ear drums ruptured and an abundance of fetid pus in the canals.

Hearing: Absolute deafness in the right ear. Conversation heard at six feet in left ear; high and low tones heard but short. Slight spontaneous nystagmus to left or better side, but no reaction with ice water irrigation in the right ear. Well marked nystagmus to the right by irrigating left ear. Although he denied having had syphilis, the Wasserman proved strongly positive. The patient was put on mercury and potassium iodide with the advice to take salvarsan as soon as he could secure it. He did not improve and in a few days returned complaining that he was getting worse and had developed a right sided facial paralysis. Salvarsan was administered and in a few days he had improved somewhat. He could hear a loud voice in the right ear and the vertigo was not troubling him so greatly. At present, two weeks later, although he had had another injection of salvarsan, there is no improvement. He is deaf in the right ear, has a slight vertigo and the facial paralysis is unchanged.

Case 2. April 3rd, 1917. Mrs. L. Age 29. Residence Louisiana. Consulted me as to a discharging ear which had not healed following a radical mastoid operation 9 years ago, by Dr. Bacon of New York City. She complained of intense vertigo, fainting spells, nausea, pain in the head, headaches and could not sleep. She was nervous and her health was gradually getting worse. Examination of right ear showed an old mastoid scar well healed, externally and internally, with the exception of a small spot over the horizontal semi-circular canal through which pus exuded.

Auditory examination: Absolute deafness in the right ear. Vestibular test showed spontaneous nystagmus at times. **Caloric reaction** with ice water: Very prompt nystagmus to the left. Fistulat test: Positive. Equilibrium: Falls to the left when standing with eyes closed. **Wasserman reaction:** Negative. This case was referred to an otologist near her home who having made the labyrinth operation reported, he found a fistula of the semicircular canal, while the vestibule and cochlea were filled with granulation tissue. Patient made a good recovery.

Case 3. April 20th, 1917. Miss F. Age 28, cashier in store. Stated her left ear had discharged pus since childhood. Had been under treatment for several years without any relief. Although her general health was good, she stated that she had dizzy spells and could not work for several hours at a time. Was also nauseated at times and declared that if she did not get relief from the dizzy spells she would go crazy.

Examination of the left drum disclosed a large perforation through which the opposite wall could be seen covered with pus. No evidence of polyps or cholesteatoma. No indications of mastoid disease. Right ear drum normal.

Nose: Atrophis rhinitis. **Eyes:** Myopic, fundus myopic changes. **Hearing:** Right ear normal.

Left Ear: Conversation, 2 feet; whisper, 6 inches; high and low tones, short; noise apparatus in good ear, hears a loud voice at 18 inches in diseased ear.

Vestibular tests: No spontaneous nystagmus while in office. **Caloric reaction with ice water:** Pronounced rotary nystagmus towards the right or well ear. **Fistula test:** Negative. **Equilibrium:** Nothing definite. X-Ray of mastoid, negative. **Wasserman reaction:** Negative.

Treatment: Radical mastoid operation advised at once which will be done in a few days.

Case one was to all intents and purposes a labyrinth operative case, an absolute deafness, no vestibular response to ice water and facial paralysis, these, almost invariably mean a sequestrium of the labyrinth. However, the positive Wasserman precluded immediate operation, although it should yet be done in case he does not progress satisfactorily.

Case two was a fistula of the labyrinth with destruction of the cochlea and the nerve endings in the vestibule and the saccule, but there was sufficient reaction to some part, probably in the semicircular canals to cause an intense vertigo so troublesome that a labyrinth operation was imperative. The radical mastoid operation 9 years ago, was no doubt the right thing to do at that time, but it was one of the occasions when that operation must be followed by the more radical procedure of removing the infection within the labyrinth.

Case three has an irritation to the vestibular portion of the labyrinth, possibly a fistula. The useful amount of hearing in the diseased ear and the danger of meningitis from a labyrinth operation, calls for only the radical mastoid operation at present, with the possibility that the labyrinth nerve endings may later become destroyed which would then call for the labyrinth operation as was necessary in case 2.

THE PATHOLOGY OF ACUTE ACIDOSIS

BY

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This paper will deal neither with the clinical symptoms nor the treatment of acidosis, but will touch on the etiology only so far as it is interwoven with the pathology. The term "acidosis" does not usually convey a distinct idea. One of the reasons for this is that we do not have clearly in mind the normal blood conditions, deviations from which produce an acidosis. Our vague impression is that some body tissue or fluid, which ordinarily is alkaline or neutral in reaction, becomes acid, this abnormal condition producing a train of symptoms.

In the first place, it is incorrect to think of an acidosis as a clinical entity, for there is always an underlying pathology which is the real disease. "Acidosis" is defined by Prof. Lawrence Henderson (1) as "any disturbance of the acid-base equilibrium whereby the power to resist acids in the body is lost." In other words, the blood loses the ability to maintain neutrality and acids are allowed to accumulate. If we have clearly in mind the processes whereby the blood neutrality is maintained and what is meant by acid-base equilibrium, we will, then, be in position to appreciate just what an acidosis is.

Regulation of Neutrality: In health, the reaction of the blood and other tissues of the body is practically neutral. The old idea that blood and body fluids are alkaline is erroneous. It was based on the observation that these fluids can neutralize acid, but we have since learned that the ability of a fluid to neutralize acid or alkali is no indication of its reaction. Acidity and alkalinity depend, respectively, upon the number of free H or OH ions, and upon nothing else. A chemical compound produces acidity just to the extent that it liberates free H when it goes in solution. A solution of NaCl is neither acid nor alkaline, because it liberates neither H nor OH in solution. We get free ions of Na and free ions of Cl, so that the solution is electro-conductive, but the neutrality of a solution is not altered by dissolving salt in it.

A neutral solution is one in which all the hydrogen (acid) ions are neutralized by an equal number of hydroxyl (alkali) ions. Distilled water is neutral because it has a very small number of hydrogen ions offset by an equally small number of hydroxyl ions. At 25 degrees Centigrade, a neutral solution like distilled water or seawater, will contain in each 1000 grams, .0000001 gram of free ionized hydrogen and .0000017 gram of free ionized hydroxyl, this condition of neutrality being expressed by "N/10,-

000,000" or "H7." If the free hydrogen ions increase so that there is more than 1/10,000,000 of a gram of ionized H (e. g., 1/1,000,000), the solution becomes acid and we express this by saying that there is an increased hydrogen-ion concentration.

Measuring the blood by its hydrogen-ion concentration, it is as neutral as distilled water (Fisher, 2). However, it is not neutral from the same reason as distilled water. Water is neutral because of the absence of free ions of any sort. Blood is neutral, although having an enormous number of alkali ions, because these are exactly neutralized by an equally large number of acid ions. The biochemical constitution of the blood and other body fluids is such that, when an acid is introduced, even in large quantities, it is instantly neutralized, and in such a manner as to leave the fluids in the same condition as they originally were (see Charts I and II).

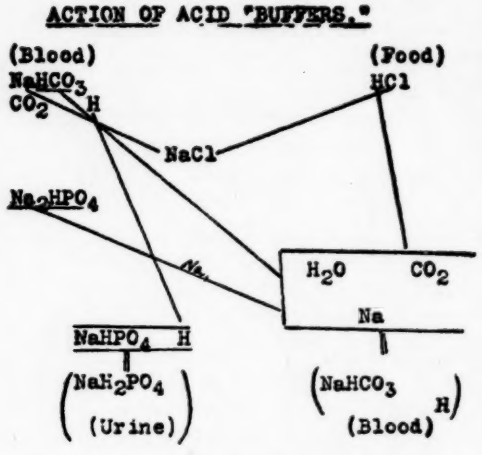


Chart I: Illustrating the action of the carbonate of the blood in neutralizing acid and restoring original condition of blood.

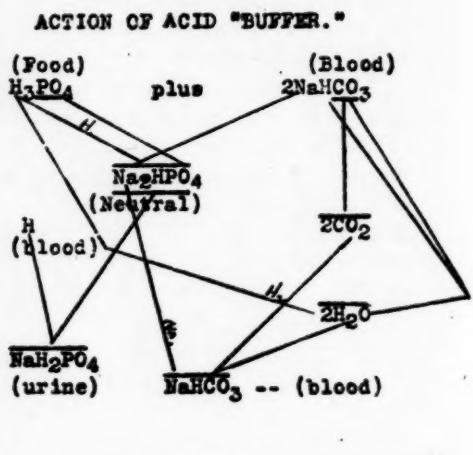


Chart II: Illustrating the action of the blood carbonate in neutralizing and excreting acid as phosphate.

This power of regulation of neutrality, which is one of the most fundamental phenomena of protoplasmic life, comprises four important activities in the human organism, as follows: (Henderson, 1.)

(1) The restitution of acid or alkali, either exogenously through food or endogenously through continuous supply of carbonic and phosphoric acids and the intermittent manufacture of ammonia during protein metabolism.

(2) Storing of alkali in the organism, in red blood cells, plasma and probably all tissue cells.

(3) Physico-chemical maintenance of *acid-base equilibrium.* The normal salts of the blood, carbonates and phosphates, are sufficient to

maintain the neutrality of that fluid against all acid introducing during health. The usual sequences are shown on Charts I and II. Acid entering the blood encounters the bicarbonate, which Henderson (1) calls the blood's third constituent; the acid is neutralized and carbon dioxide liberated; this is removed by the lungs and a neutral salt is left. If the acid reacts with phosphate, the salt formed in the blood is the neutral salt; in the kidney this is changed to the acid phosphate, thus removing additional acid.

One *emergency method* of removing surplus acid is through the amphoteric property of protein of combining with either acid or alkali as occasion demands. Still another method is through the use of ammonia formed during protein catabolism (see Charts V and VI). The body can even destroy its own proteins to produce ammonia for combatting acid.

(4) Excretion. However efficient the neutralization of acid and alkali in the body may be, the preservation of neutrality is absolutely dependent upon the prompt excretion of acid and acid salts. This excretion virtually means elimination of carbon dioxide by the lungs and acid phosphate by the kidneys.

Chemistry of Acidosis: While acute acidosis is found associated with many diseases, the exciting causes are practically the same in every case; that is, either the sudden introduction into the blood stream of overwhelming amounts of acid, or the sudden cessation of elimination of acids by the kidneys, or both. The introduction of sufficient acid to wipe out the alkali reserve of the blood may practically always be traced to a failure of metabolism to thoroughly oxidize acids, or to the formation of abnormal quantity of acids in the intestinal tract. Such an acidosis, once started, continues in a vicious circle. A typical illustration of acidosis resulting from suboxidation is seen in carbon monoxide poisoning. Yandell Henderson (3) has shown that when one-third of the hemoglobin of the blood is bound by CO, an intense acidosis supervenes, disappearing as soon as this hemoglobin is freed and resumes its oxygen carrying function. This explains the extreme susceptibility of children to acidosis, since they are known to have imperfect oxidation processes and a low alkali reserve, as compared with adults.

The perversions of combustion processes along the alimentary canal or in the course of metabolism, leading to the introduction of abnormal acids, or their formation in the blood stream, are the fundamental causes of acidosis. The substances which attack the alkali reserve usually belong to the acetone or ketone group and can be derived from either of the three classes of foods. As a matter of fact, carbohydrates do not give rise to them, for the simple reason that the carbohydrates, on account of their chemical construction. are so readily oxidized (see Chart III). Furthermore, they are directly antiketogenic in that, when oxidized, they assist the combustion of fat. This old physiological principle has

been reduced to mathematical exactness by Zeller and Lusk, and we now know that for the combustion of three molecules of fat, one molecule of glucose must be simultaneously burned, else the fat will not be entirely oxidized. As Woodyaft (4) expresses it, "when the proportion of glucose is less than this the fat is not oxidized and the body smokes like an auto engine with too much oil in the cylinder."

The origin of the acids of acidosis, therefore, is from the fats and, to a lesser degree, from protein. "It (4) is at present common knowledge that betahydroxybutyric acid and its two cogeners, betaketobutyric and acetone, known collectively as the acidosis compounds or acidosis bodies, arise from products formed in the catabolism of fats and proteins and more specifically from certain of the lower fatty acids containing an even number of carbon atoms, in particular perhaps, butyric acid. These lower fatty acids may be formed from the higher fatty acids and from certain of the amino acids."

The usual source of abnormal acid is from the lower fatty acids. The reasons for this are simple. (1) Fats undergo less chemical change in the intestine than either of the other foods, being thrown into the blood stream and offered to the tissues for metabolism in comparatively large molecules; consequently more time and more combustion energy are required to bring them to forms which are not acid; (2) they are acid throughout their entire catabolism, so that the tissues are in contact with acid compounds for a longer time and must furnish more alkali to keep these compounds neutralized; (3) proteins are amphoteric, while fats can only be neutralized by alkali; (4) proteins furnish ammonia by deamination, thus helping to neutralize their own acid products, while fats must be taken care of entirely by the reserve alkali of the blood. An example is shown in Chart III, of stearic acid, one of the normal acids of food. By simple oxidation, requiring eight atoms of O for each molecule of stearic acid, we secure four molecules of butyric acid and one molecule of acetic acid; eight additional atoms of O will be required to bring all the butyric acid to acetic, whereupon there must be immediately available sufficient oxygen to oxidize the acetic acid to carbon dioxide and water, else the alkali reserve will be called upon. It will be noted that, as the oxidation of fat proceeds, the products become more and more acid, so that when the catabolism of fat begins, there must be available for each molecule of stearic acid, fifty-two atoms of oxygen, in order to bring the fat to the stage of CO^2 and water, without calling on the alkali reserve. The simultaneous combustion of carbohydrate would diminish this necessity considerably.

That protein is a source of acidosis compounds very frequently, is gaining more and more attention, and we must not overlook deviations from normal digestion and metabolism of protein when seeking the source of an onslaught on the neutrality of the blood.

WHY FATS CAUSE ACIDOSIS

$C_{17}H_{35}O_2$ (stearic acid) + O_3

$C_6H_8O_2$ ' $C_4H_8O_2$ ' butyric acid $C_5H_8O_2$ ' $C_6H_8O_2$ '

$C_2H_4O_2$ acetic acid

CH_2O_2 formic acid

$(C_6H_{10}O_5)^n$ - starch + H_2O

$C_6H_{12}O_6$ - glucose

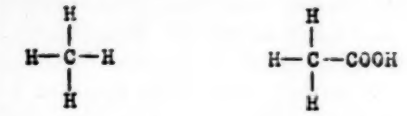
$C_6H_{12}O_6$ minus H_2O equals

$C_6H_{10}O_5$ - glycogen

To oxidize one mol. $C_{17}H_{35}O_2$ to CO and H O requires 52 atoms of oxygen.

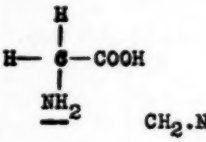
To oxidize one mol. of $C_6H_{10}O_5$ requires 18 atoms of oxygen.

Chart III: Illustrating the difficulty in oxidizing fat, compared with the ease with which carbohydrate is hydrolyzed.



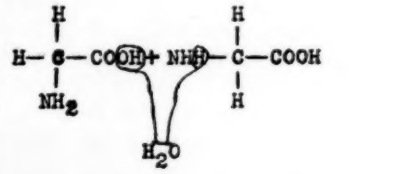
CH_4 - methane

$CH_3.COOH$ - acetic acid



Amino-acetic acid (Glycin)

$CH_2.NH_2.COOH$



$CH_2.NH_2.CO.NH.CH_2.COOH$

(Simplest possible polypeptide)

Chart IV: Showing the relation between organic acids, amino-acids and polypeptids.

An organic acid may be regarded as a hydrocarbon (e. g., methane) in which one H atom is replaced by the carboxyl radical (COOH), this being the characteristic group of all organic acids.

An amino acid may be regarded as an organic acid (e. g., acetic), in which one of the remaining H atoms is replaced by the amine radical (NH^2).

A polypeptid is the product of the union of two or more amino acids, this union occurring by hydrolysis, the OH of one carboxyl uniting with one H of the opposite amine radical.

The chemical origin of such abnormal acids is easily seen by studying the construction of the amino-acid. As Underhill (5) has shown, the proteins are broken up in the intestines and absorbed as amino-acids. In the present stage of knowledge of physiological chemistry, the whole tendency is to regard the protein molecule as a huge polypeptid containing hundreds and thousands of amino-acids linked together in inconceivably complex compounds. In Chart IV, the relation between organic acids, amino-acids and polypeptids is shown. We know that normal digestion splits the protein molecule into amino-acids and that these are absorbed directly into the blood, where they are immediately neutralized or further oxidized. There is a stage in hydrolytic cleavage of polypeptids where ab-

sorption and utilization best occurs. Failure of digestion to bring them to this stage causes the absorption of products which require further oxidation in the blood stream. If the blood trypsin and metabolic processes are unequal to this task, we have a sudden call on the alkali reserve to neutralize these acids. On the other hand, if the oxidation in the intestine should be carried beyond the normal stage by bacterial putrefaction, there is absorption of acids which are not amphoteric and which demand more alkali than normal products of digestion would. An enormous amount of acid may be introduced in this way.

The amino-acids which are absorbed into the circulation must be oxidized to lower forms, and conditions of suboxidation may cause this catabolism to stop at a dangerous point. To illustrate (Chart V), leucin is a normal product of protein digestion and is absorbed as such into the blood, where it is immediately taken in hand by the chemical laboratory of the tissues. Generally the first stage in the catabolism of an amino-acid is that of de-amination and oxidation, splitting off ammonia and adding oxygen. With leucin, this leaves ketone acid and one ammonia radicle which can be either used as an emergency alkali or united to carbon dioxide and eliminated as urea (see chart). By oxidation of the ketone acid, there is formed iso-valeric acid, one of the lower fatty acids of the acidosis group. Further cleavage of this product gives acetone and acetic acid

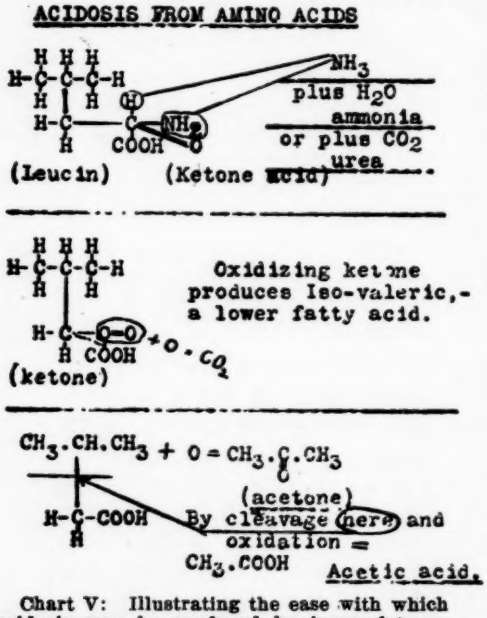


Chart V: Illustrating the ease with which acidosis may be produced by incomplete or perverted metabolism of proteins.

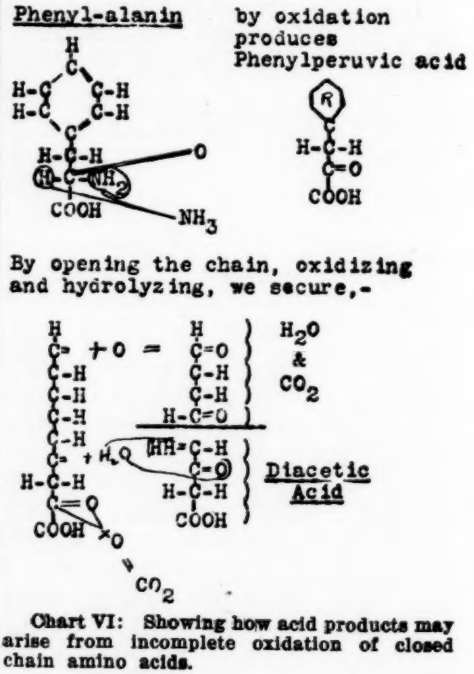


Chart VI: Showing how acid products may arise from incomplete oxidation of closed chain amino acids.

which, normally, are carried through to carbon dioxide and water. It is easy to see that trouble will result from failure to carry through these last stages of catabolism.

In the case of the slightly more complicated closed ring amino-acids, they will be treated as in Chart VI. Phenylanalin, a constant derivative of gelatin is deaminized and oxidized to phenylperuvic acid. The chain is then broken open, leaving a compound unsaturated at two points; here by oxidation and addition of water, carbon dioxide, water and diacetic acid are produced. Normally, the diacetic is oxidized to its end products, but conditions of suboxidation may prevent this last step and invite acidosis.

Another exogenous source of abnormal acid which has not received the attention it deserves is putrefaction of food in the intestine. Much has been written on stasis and intestinal intoxication, but the entire field is chaotic. Vincent (6), years ago, insisted on the importance of the intestinal bacteria in the disturbance of infant and child metabolism, and the importance of maintaining a certain ratio between the lactic and colon

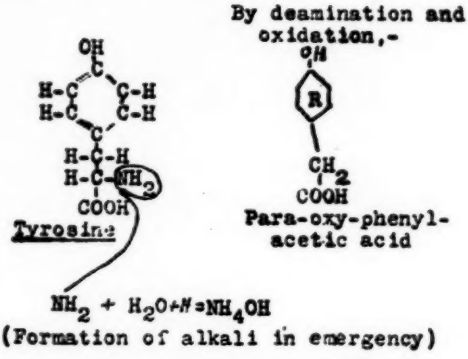


Chart VII: Illustrating the method of producing acid compounds by bacterial putrefaction of tyrosin.

groups, keeping the latter in the minority as long as milk is the principal food. The recently demonstrated fact that putrefactive bacteria do not grow on pure proteins, but require the simpler amino-acids for their nourishment, coupled with the facts just stated, that amino-acids are the normal products of digestion, suggest important possibilities. Granted the presence of abnormal numbers of putrefactive bacteria, especially in the terminal ileum and cecum and a stasis of food or food residue containing amino-acids, and what is to be expected? One illustration will suggest a host of similar ones. Tyrosin, a normal result of protein digestion, is an amino-acid which is especially susceptible to bacterial putrefaction, going through the changes shown (Chart VII), when acted on by bacteria. The ultimate products either before or after absorption will be diacetic acid. It will be recalled from the chart showing the oxidation of stearic

acid (Chart III), that formic acid (CH^2O^2) is in the scale just below acetic acid, and is formed by oxidizing the latter. Formic acid is a characteristic result of bacterial action on fat in the intestinal tract and is oxidized to simpler forms with great difficulty.

Failure of Elimination: Having reviewed the sources of acidosis compounds, we will consider, briefly, the second pathological basis for the condition; namely, the sudden failure of the kidneys to eliminate the acids brought to it by the blood. Diseases of the respiratory tract frequently limit the intake of oxygen and the excretion of CO^2, to such an extent that acidosis follows, but, usually, as long as the kidneys are functionating normally, there will be no dangerous accumulation of acid. The kidney removes acid almost entirely in the form of sodium dihydrogen phosphate (Charts I and II). The phosphate of the blood is the neutral salt, with two atoms of Na and one atom of H. The salt which leaves the kidney contains one atom of Na and two atoms of H. This means that the kidney not only removes the products of acid neutralization, but goes one step further and inserts an extra atom of acid H, which it takes from the blood, and returns an atom of Na to be added to the alkali reserve of the blood. When the kidney fails to perform this function, or when the entire kidney function is suppressed, acid rapidly accumulates. Phosphoric acid, entering the blood stream with food, changes the neutral phosphate to the acid salt, which remains to work havoc. Hydrochloric acid uses up the bicarbonate, and the alkali reserve is soon wiped out.

The diseases of the kidney which cause phosphate retention are beyond the scope of this paper.

Histo-Pathology: The histological changes produced by acute acidosis per se, have received scant mention in literature. These consist in a cellular edema, cloudy swelling of the cytoplasm, degeneration of nuclei, death of the cell and ultimate absorption of the cell substance. This is the uniform change, and the histological picture will depend on the organ examined. In the kidney we have this sequence of events resulting in (a) diminished or suppressed secretion through closure of the tubules by cellular edema; (b) as the cells degenerate, the tubules are filled with detritus, albumen and all kinds of casts appear in the urine; (c) finally, a diffuse destruction of the functional elements of the kidney. Abt. (7) describes a violent form of acidosis in children, ushered in with gastro-intestinal infection, quickly producing an overwhelming acidosis; the alkali reserve being wiped out, a violent nephritis follows, and death soon follows. One such case seen by the writer and examined at post mortem showed the above described histological picture in the kidney.

Tests: A few words about the comparative value of the several groups of tests for acidosis. These are four in number.

(1) *Urinary Acidity:* The ordinary tests for acetone and diacetic acid should be taken as danger signals only. If either of these substances

are present in any quantity, the physician should be on the lookout for an acidosis. However, an acetonuria is not, by any means, conclusive proof of acidosis. Conversely, we may have an intense acid intoxication with little or no acetone in the urine, because diminished alkalinity is a condition very unfavorable for diuresis (Marriott, 8). The hydrogen-ion acidity of the urine as compared with the titration acidity, is very suggestive. Many chronic nephritics have a highly acid urine, with a great diminution of acid phosphate. This is due to the presence of acid H in the urine, as proven by indicators, while the phosphates have been retained in the blood, as proven by the low titration acidity of the urine. The hydrogen-ion acidity may reach the extreme danger point, while the urine will show a very low titration acidity to alkali. In the absence of evidence in the urine, sufficient to make a diagnosis of acidosis, the permeability of the kidney must be known before we accept the negative evidence of the urine.

(2) *Alkali Reserve:* The reserve alkali of the blood is a very constant factor and variation from it is produced only by pronounced chemical changes in the blood. Testing the blood serum for its alkali reserve will give the most accurate information regarding the conditions present at the particular time. However, it has the disadvantage that the alkali reserve changes more rapidly than any other indication, being restored as suddenly as it was lost. Furthermore, the restoration of the reserve alkali does not always stop the acidosis.

(3) *Alveolar Tension:* This is an indirect method of estimating the quantity of acid in the blood. It is based on the fact that the carbon dioxide tension in the alveoli of the lungs corresponds almost exactly to the carbon dioxide tension in the blood, coupled with the additional fact that the harmone of respiration is the hydrogen ion and not carbon dioxide, as formerly thought. As acid increases in the blood, it combines with the carbon dioxide, and at the same time stimulates the respiratory center, thus emptying the alveoli of the lung of carbon dioxide. So that by testing the amount of CO^2 in the air breathed up from the depths of the lung, we attempt to arrive at the corresponding amount of CO^2 in the blood and, thus, indirectly, at the amount of acid which is present. Various conditions vitate the reliability of the alveolar air test. These are those which tend to increase the respiratory rate and thus ventilate the lung more than normal, as well as conditions which will prevent ventilation of the lung and frustrate the effort to secure an air specimen from the depths of the organ.

Alkali Tolerance: By feeding measured amounts of bicarbonate of soda, we ascertain the amount of alkali required to produce an alkaline reaction in the urine. This tells us the amount of alkali required to neutralize the acidity of the blood, because only after this has been neutralized will alkali begin to appear in the urine, as shown by reaction with alkali indicators.

Acidosis is gradually gaining a place of commanding importance in the pathology of acute diseases. Many of the histopathological changes which were formerly attributed to the effects of toxins can just as readily be due to contact of cells and tissues with acids. It is certainly true that, in the evolution of all forms of life, from the primordial cell to homo sapiens, the maintenance of neutrality is the one fundamental prerequisite to the existence of life, and elaborate provision has been made to combat the invasion of acid. Where Nature speaks so plainly, we who are but humble pupils of the great teacher, must listen.

REFERENCES

(1) L. J. Henderson, Harvey Lectures for 1914-15.
(2) Fischer, "Edema and Nephritis."
(3) Yandell Henderson, Jour. A. M. A., Vol. LXVII, p. 580.
(4) Woodyatt, Jour. A. M. A., June 17th, 1916.
(5) Underhill, "The Physiology of the Amino Acids."
(6) Vincent, Amer. Jour. Dis. Children, Feb., 1914.
(7) Abt., Amer. Jour. Med. Sci., Jan., 1914.
(8) Marriott, Jour. A. M. A., Aug. 1st, 1914.

KIDNEY CONSERVATION

BY

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(Read before the 3rd Annual Meeting of the Southwest Medical and Surgical Association of the Southwest, El Paso, Texas, Dec. 7th, 1917.)

The open season for kidneys is drawing to a close. It is not very long since kidneys were in nearly as much danger of elimination by surgical sportsmen as ovaries had been a few years before. Almost anything was a "surgical kidney," and nephrectomy is a spectacular operation. Hence, many a kidney has been sacrificed, either because the surgeon knew no better, or because the methods by which it might have been saved are such slow and careful ones. That treatment which is quick and usually effective, even though it involves a serious sacrifice for the patient, is a temptation to the surgeon. It seemingly solves the problem in one masterly stroke. The patient remains well long enough for the doctor to collect. Also, the subsequent history is often not known by the surgeon, for when kidney number two begins to resent the insult, the patient frequently seeks a new source of advice. So the surgeon loses the opportunity to see ultimate results and continues to follow a course which he would abandon if he could broaden his insight.

There is much to be said in favor of developing insight. It is an unfortunate fact that the great men in the profession have a contact with each patient which is merely tangential. The patient does his getting

sick and getting worse under the care of his family doctor. Limitations of various kinds handicap the doctor and, many times, he is unwilling, or unable, to use the time and painstaking patience, as well as study, which might check the trouble early. In time the patient goes from bad to worse, and is taken to a surgeon. Nephrectomy is advised and done; the patient goes home and is under the care of the family doctor again. All is well for a time, but presently the other kidney goes wrong. The doctor reasons that it is the only kidney left, and that the surgeon said the cure for its similarly affected mate was to remove it. Removal of the remaining kidney is out of the question. Therefore, the only thing to do is to make the best of an unkind fate and ease the patient to the grave. It is not worth while to consult the surgeon about this kidney.

Hosts of such cases are not reported to the surgeon. In his statistics the case is listed as a cure or as lost from observation. Meantime he is doing the same thing to scores of other cases. The ultimate results in some of them are known to him, but many are lost in the hurry and bustle of the everpresent urgent calls on his time, attention, and skill. The surgeon may be, and usually is, honest in his statistics. But sometimes he lacks the facts and hence is apt to be led astray in his conclusions. This causes him to do more nephrectomies, and to fail to try out the other methods by which catastrophies can many times be avoided.

Let it be understood, I am not condemning surgical enthusiasm and calling surgeons ruthless. As a class, there is no more conscientious body of men on earth. But every man has to draw his conclusions and determine his actions on the basis of the facts he has to command. The more narrowly a man specializes, the more limited is his contact with the individual patient. And the men who specialize most intensely are the men who lay down the surgical laws. In gaining depth they lose breadth of vision, and it is conceivable that this may make it advisable to accept their conclusions with care. This is one of the penalties of specialization. It is a penalty which seemingly must be endured on account of the many counter-balancing advantages of the system; but, if we wish to arrive at any correct conclusion, we must consider the personal equation when we seek the advice of those who have authority to speak on a limited subject.

There are many kidney conditions which demand, and must have, radical surgery. But there are many other kidney conditions which have been treated radically by removal when more conservative methods would have saved the kidney. This applies especially to the acute infections. It is by no means true that a kidney full of pus is a kidney which must be removed or even drained. The work of Rollier in surgical tuberculosis has decidedly changed our ideas about removing tuberculous kidneys. The use of autogenous vaccines and actinotherapy has proved that a large percentage of the cases of pyelitis and pyonephrosis may be cured, providing we are willing to take enough time and trouble. Even such cases as were formerly treated by nephrectomy or drainage often yield to conservative

measures leaving more functioning kidneys than can be secured by rash surgery. Long ago we learned to wait for a line of demarcation in gangrene. We found that Nature is better able to determine the line between dead and living bone than we can determine with a chisel. There is a time to amputate in gangrene. There is a time to do sequestrotomy in our bone work. There is also a time to wait for Nature to tell us what she can do with a damaged kidney.

In kidney tuberculosis we know that the result of surgical treatment is, at best, a compromise. Fifty per cent of the kidneys which are demonstrably free from infection, eventually succumb to disease. This is due to several causes, all of which should teach us to use patience. The mere repeated absence of tubercle bacilli from the urine of a catheterized ureter does not prove that kidney non-tuberculous. The bacilli will not enter the urinary tract until the tuberculous foci have reached a condition analagous to the second stage in pulmonary tuberculosis. Previous to that time these foci are amenable to the same curative influences as are the analagous pulmonary lesions. They respond to rest, fresh air, good feeding and immunizing therapy. *But they require time.*

The most frequent mistake for which we of the Southwest chide our Eastern and Northern colleagues, is the fact that they often tell the patients they send to our country that they will be well in a few weeks or months. No one who has had much to do with tuberculosis will feel at all safe about even an early case until from two to five years have elapsed. So we endeavor to impress this fact on the pulmonary patient and deliberately plan a long siege. If we don't do so, we lose. Then why can't we use equally good sense in kidney tuberculosis? Why do we refuse the patient his chance to heal a lesion which would merely scar an organ, and deliberately deprive him of the entire organ? On a par with our dictum that it is necessary to remove a tuberculous kidney, would be a verdict that we must remove a whole lung every time we find a tuberculous spot in it. I maintain that there are as many spontaneous and unknown recoveries from kidney tuberculosis as from pulmonary tuberculosis. I go farther and assert that the proportion of recoveries is probably higher. This is because the kidney is an immobile organ. The lung is not, even when compressed by artificial pneumo-thorax. In this procedure we try to approximate absolute rest, with the intention of restoring the undamaged part later to an approximately normal physiological activity. The only way to stop the function of a single kiney is to kill it—to remove it—and this precludes the posibility of ever using even its undamaged portion again. We put the pulmonary patient to bed to lessen the work his lung has to do—to approximate complete rest as nearly as we may. The functional activity of the kidney is directly proportional to the amount of the body waste it must eliminate. The less bodily activity, the less waste, and, hence, the less kidney activity. Certainly it is logical to put the kidney case to bed for as long a time as we do the lung case. But such a course is tedious and

uninteresting—so out comes the sick kidney and a double load is thrown on the fellow kidney. There is at least a 50 per cent chance that the remaining kidney has incipient foci of tuberculosis. The double duty hastens the development of these foci and often makes them incurable.

The analogy can be carried farther. In the open stage of pulmonary tuberculosis most of the mixed infection is metastatic. It is so with a tuberculous kidney in the open stage. Thorough search for pus infections elsewhere in the body, and their elimination, is essential in the proper care of pulmonary tuberculosis. It is of equal or greater importance in the kidney case. The treatment of such pyogenic foci is never complete until we have fortified the organism by using vaccine therapy, and the kidney case should have the advantage of this. If the original focus of infection cannot be found, the pathogenic micro-organisms can usually be secured by ureteral catheterization, and a vaccine made.

Another pernicious practice is that of leaving the ureter when a tuberculous kidney is removed. It is in only a limited proportion of such cases that the ureter is removed—and it is usually infected. Most surgeons simply tie its upper end and leave it. Some inject a little carbolic acid and leave it. It almost always causes trouble and must be removed later. I have repeatedly catheterized ureteral stumps and proved them to be hot-beds of tuberculosis. If we remove a tuberculous kidney, let us at least do a good job. Such a kidney is not properly removed unless the entire ureter is removed with it. Even if it does not show macroscopic evidence of disease at the time, it will almost invariably do so later. If the other kidney is not already infected, the chance that it will be is materially increased by leaving the ureteral stump. The attempt to treat the stump later by way of the ureteral catheter is not successful. Like all other organs whose work has been taken away it becomes a trouble maker. If you *will* remove the tuberculous kidney, do it thoroughly; and that means take out the urinary tract clear down to the bladder.

Tuberculosis of the kidney is usually secondary to tuberculosis elsewhere in the body. There is no disputing the fact that many tuberculous kidneys must be taken out. In more than half of these cases the removal of the kidney fails to cure the patient. As well try to cut down a tree by pulling off its leaves as to undertake the control of tuberculosis by lopping off a diseased organ here and there. I have mentioned rest as essential to the cure. It is also advisable that tuberculin or Spengler's Immune Serum be used, the former when there is no fever, never when fever is present; the latter when there is fever. I have seen results from it so oftem that there is no doubt in my mind of its efficacy. But it must not be used like dynamite. The most powerful forces in Nature are the quiet ones. They are also the slow ones. The reason why many doctors do not get results by the use of tuberculin is because they are unwilling to be patient and painstaking. Much of the success of tuberculin therapy depends upon the willingness to spend time and effort to explain

to the patient what is being done and why. The patient's mind must be kept right. It does little good to regulate the patient's rest and diet if, in that patient's brain there is going on a storm of doubt, unrest or rebellion.

There are several ways of gaining the cooperation of the patient. One way is to browbeat him into obedience by assuming a Jovian attitude. That seldom lasts long, for sooner or later the patient sees through the bluff, and when confidence is thus lost, it is gone forever. Another way is to be mysterious and profound, and ape the charlatan. The kind of patients who can be thus controlled are of the spineless type and they usually falter and fail before the goal is reached. The best way is to educate the patient. One of my colleagues says that the treatment of tuberculosis would be simplified if the appendix were removed in the early stages. He may be right, but I can't see it his way. My idea is that the first thing necessary is to be honest with the patient. Explain to him the nature of the disease, and then carefully educate him to understand exactly what must be done and how long it will take, always clearly pointing out the reason. Many will wilt at the outset and quit. They are good riddance, for they are made of the stuff that can't make a successful fight, and the effort spent on them would probably be wasted. But the ones who are worth while will, through this candid treatment, become real helpers, and their chance of recovery will be greatly enhanced. It is a lamentable fact that our trend toward pathology and fine-haired diagnosis, which is all very good and is to be encouraged, makes us better scientists but poorer doctors. In the actual work of making sick people well we must remember that we are not veterinarians, but are dealing with thinking people. And we must not lose sight of the fact that the intelligent cooperation of the patient is of prime importance in any fight which is sure to be so prolonged as that against tuberculosis.

In non-operative treatment of kidney tuberculosis, one therapeutic aid of great value is heat. In my experience this can most effectually be used in this class of cases by means of a therapeutic lamp. The rays of a powerful incandescent lamp, concentrated over the kidney region for half an hour every day will, unquestionably, cause a hyperemia which is not entirely superficial, but which affects the kidney as well. Free sweating is induced, which lessens the duty of the kidney, and also, what is more important, the hyperemia is curative. In the cases in which one kidney has been removed and tuberculosis has developed in the remaining one, this treatment is capable of slowing the disease and lengthening the life of the patient very materially. I have one case of this sort in which I am satisfied that two years have already been added to the patient's life. During this time her daily urinary flow has never been over ten ounces and averages about seven ounces. This urine is about one-fourth pus and loaded with tubercle bacilli. By daily bakings she has not only lived and been fairly comfortable for two years, but during that time has been able to

be the guide of a daughter who is just approaching womanhood, the time when a mother is most needed.

In time past, I may have been over quick to do nephrectomy in pyonephrosis, and I may err on the other side now. But it is a source of satisfaction to look back over the past four or five years and recall many patients in whom formerly, I would have removed a kidney, and to see them now alive and well and still with their full quota of kidneys.

One young woman had unilateral pyonephrosis. Infection was by an unidentified diplococcus. She had a temperature of 104 degrees every day for four weeks. She was intensely septic and, if ever there was a case for nephrectomy, this was one. But she still has both her kidneys, and within eighteen months of the time of her acute infection, she gave birth to a normal child and had no trouble with her kidneys during the pregnancy. I attribute her cure to an autogenous vaccine and patient care The more I see of such cases, the fewer nephrectomies I perform. The other course takes more time and work, but I have seen them recover so many times that I always give them a chance.

Kidney surgery is an attractive field. There is plenty of chance for its exercise outside of the infections, and, especially in the acute cases, it is worth while to give the kidney a chance. A kidney saved to usefulness is far more of a triumph than one sacrificed to the Moloch of surgical skill.

My object in presenting this paper is to plead for conservatism. Even if what is saved is only a part of a kidney, it is useful and the patient has a right to it. By following the conservative course, you will be surprised to see how many so-called "surgical kidneys" will reform and lead exemplary lives, if you give them a fair chance.

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Items of interest, with the name of the sender will be acceptable.

Books for review should be sent to The Editor, care of the Medical Library, 320 Roberts-Banner building, El Paso, Texas.

Advertisements of proprietary medicines must have had the preparations approved by the Council of Pharmacy, A. M. A.

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EDITORIALS

SAVING MOTHERS

More women 15 to 45 years of age die from conditions connected with childbirth than from any disease except tuberculosis. About 15,000 deaths from maternal causes occur annually in the United States, and the available figures for this country show no decrease in the maternal death rate since 1900. Maternal deaths are largely preventable by proper care and skilled attendance.

These 15,000 deaths do not measure the full extent of the waste. They are merely a rough index of unmeasured preventable illness and suffering among mothers. Furthermore, certain diseases of early infancy are closely connected with the health of the baby's mother and the maternity care she has received, and these diseases cause about one-third of all the deaths occurring among babies under one year of age. More than 75,000 babies die each year from this group of diseases because they do not have a fair start in life.

The life and health of the mother are in every way important to the well-being of her children. Breast feeding through the greater part of the baby's first year is his chief protection from all diseases, and mothers are

much more likely to be able to nurse their babies successfully if they receive proper care before, at, and after childbirth.

The expectant mother should at once consult a physician. She should remain under supervision so that any dangerous symptom may be discovered as soon as it appears. She should learn how to take care of herself, and she should have proper food and rest and freedom from anxiety. When the baby is born the mother needs trained attendance. A difficult maternity case is one of the gravest surgical emergencies. Many people do not seem to understand that in any case complications may arise which can be met safely by prompt and skillful scientific care but which at the hands of an unskilled attendant may cost the life of mother or child or both. Even after confinement the mother needs continued supervision and rest until her strength has returned.

Thousands of mothers, both in city and county, do not have the essentials of safety, partly, perhaps chiefly, because they do not realize the dangers involved in lack of care or else accept the dangers as unavoidable. Many women are at present unable to obtain proper care, but when all women and their husbands understand its importance and demand it for every mother, physicians will furnish it, medical colleges will provide better obstetrical training for physicians, and communities will see to it that mothers are properly protected.

Little has been done as yet to show women that much of the waste of mothers' lives and health is unnecessary. Even less has been undertaken by communities to provide protection for them. Many communities which have studied their typhoid and tuberculosis death rates and have undertaken costly measures to reduce them have been heedless of the death rates among mothers. It is not strange therefore that since 1900 the typhoid rate for the country as a whole has been cut in half, and the rate from tuberculosis has been markedly reduced, while the death rate from maternal causes has shown no demonstrable decrease.

Just how the importance of adequate maternity care is to be made plain to a community, and just how skilled care and instruction are to be made available for all mothers, are of course local questions to be considered by each community. The prenatal clinics and prenatal nursing which are being developed in many cities suggest a method of supervision and instruction which might well be extended. Even in cities where such work is carried on and where good hospitals are numerous, the number of mothers reached is small in comparison with the number who bear their children without adequate care.

Difficulties are perhaps greatest in rural districts where the sheer inaccessibility of a physician is often added to the other elements of the problem. Here a public nursing service with headquarters at the county seat, or other accessible town, would probably be the first step, placing at the service of every expectant mother a visiting nurse who is especially

equipped to give her information about personal care and to watch for symptoms of trouble demanding medical advice. As such a nursing service develops, its headquarters might become, with the cooperation of physicians, a sort of maternal and child-welfare center to which not only expectant mothers but also mothers with babies could come for instruction, examination, and advice. If no general hospital were conveniently near, a cottage hospital for mothers and babies might ultimately form a part of such a center.

A more general use of existing provisions for scientific maternity care and the extension of provisions for such care in all types of communities should serve to reduce the number of deaths among mothers and babies and to improve the health and general condition of children throughout the country. A full discussion of the causes and prevention of maternal deaths and an analysis of available statistics, are contained in a report on Maternity Mortality, published by the Children's Bureau.

The Children's Bureau has several publications which are of interest in connection with work for the welfare of mothers and babies. A list of these publications will be sent upon application to the Children's Bureau, Washington, D. C.

The increased cost of publication and the generally high cost of material makes it necessary for SOUTHWESTERN MEDICINE either to suspend publication temporarily or to reduce the number of pages in each issue. The Board of Managers has decided that the latter course is the one to pursue, and therefore, beginning with this issue the number of pages will be reduced to an average of 32 in each issue until such time as conditions and the income of the Journal warrant an increase in size.

The article on Infantile La Grippe published in the July issue and credited to Doctor W. W. Dill of Albuquerque should have been credited to Doctor M. K. Wylder of Albuquerque.

BOOK REVIEWS

WHAT IS PSYCHOANALYSIS?

By Isador H. Coriat. Moffat Yard, New York, 1917. Price 75 cents.

The immortality and importunity of truth hidden in therapeutics is strikingly seen in the way she has of appearing under a new name and vesture to appeal against a condemnatory verdict. I once made an ebb and flow chart of hypnotism covering a thousand years up to the mental healing which ran up to fever heat in 1908, then ebbed slowly until 1914 when "Psychoanalysis" came up for judgment, denying any connection with suggestion. To use Dr. Coriat's words:

"Psychoanalysis reaches the fundamental difficulties of the nervous illness, whereas suggestion merely side tracks it or covers it up for the time being." "A learning to see and accept one's self in the past and present tendencies," says another writer. "Not to know in detail why they are sick, but, through changes and re-adjustments in their lives made in the light of knowledge, to reach a cure." In plain words the skeleton in the closet is not denied; no "suggestion" is made as to its non-

existence, but the bony enemy is hauled out, taken to pieces and the fear of it proved to be absolutely unnecessary. It is difficult to agree that the "remote cause" is not possibly created or removed by suggestion, searching, perhaps, for a man or straw and then knocking him down. Perhaps psychoanalysis might be termed "militant suggestion." It does not seek to change the mental attitude toward disease but to remove the cause of it; it chases the patient out of all excusative trenches and forts, leaving him without a leg to stand on but mentally fit to kill the enemy.

Statements as to the cause and significance of dreams are condensed almost to non-lucidity. Larger views can be had in the more profound volumes given in the bibliography, but, given a cup of black coffee and three or four hours uninterrupted leisure, even the average doctor may get useful ideas of Psychoanalysis.

—D. W.

Medical and Surgical Reports of the Episcopal Hospital. Philadelphia. Vol. IV, 1916. W. J. Dorman, Philadelphia.

It is generally in Reports, Transactions, and Proceedings that the cream of matters surgical and medical is found, and for that reason even the old volumes of such form deeply interesting reading. In the recent ones the sons and grandsons of the pioneers, aided by modern laboratory findings, are seen clearing away obstacles the older men hardly dreamed of attacking. Volume IV of the Episcopal Hospital Reports edited by Dr. A. P. C. Ashhurst, bears out my first statement. There are four good papers from the editor himself, one on the Mosetig-Moorhof Iodoform Wax Bone Filling. I. M. Boykin has a useful paper, doubly interesting in war time, on A Method of Skingrafting, while Rutherford L. John is interesting in his Caries of the Spine Treated by Bone Transplanting. Frederick Krauss gives a Method for Ligation of the Ophthalmic Vein for Ophthalmus, and Edward Crossen, in one of his four papers, tells of A Bacillius Aerogenes Capsulatus Infection of the Shoulder, with Recovery. The illustrations do not bear that cheap impress which so often renders such useless in elucidating the text.

THE ROENTGEN DIAGNOSIS OF DISEASES OF THE ALIMENTARY CANAL

By Russell D. Carman, M. D., Head of Section on Roentgenology, Division of Medicine, Mayo Clinic, and Albert Miller, M. D., First Assistant in Roentgenology at the Mayo Clinic. 504 original illustrations. Philadelphia and London, W. B. Saunders Company, 1917. Cloth $6.00 net, Half Morocco $7.50 net.

This book, a collection of the papers that have appeared from the Mayo Clinics during the past few years, shows all the principles subjected to the acid test of time and checked up in the operating room. The claims made for the X-Ray may be looked upon as reliable and not as results given by an enthusiastic specialist.

The plates, while not as elaborate as some that have appeared in other works, indicate clearly the condition under consideration. The text reference to cases quoted is somewhat confusing and might easily be better arranged from a referential point of view.

Otherwise, the whole style of the book is clear and concise, a characteristic common to all the books coming under the editorial management of Mrs. M. H. Mellish.

—J. W. C.

LABORATORY TECHNIQUE.

The Methods Employed at St. Luke's Hospital, New York

By Drs. F. C. Wood, Karl M. Vogel and L. W. Famuleuer. 1917. Dougherty, New York, price 75 cents.

This is a very concise and practical little book because all the uncommon and unnecessary things being left out, it is an every day working model.

In compiling a set of methods like this, it is somewhat like trying to make a cook book with the 500 best recipes obtainable. That is, no two cooks would agree on what were the 500 most important, and so it is that no two laboratory workers would agree as to what single method, for each case, is the best. In a small book like this, where only one method is given, it has, of course, some disadvantages, but it also is an advantage in that it does not furnish so many things that choice is difficult. For general laboratory work, the book as a whole is to be recommended, though anyone doing special work has his own pet methods. However, even an expert likes to have on hand a list of the methods used in a laboratory of a large hospital. Anyone wishing to do such work, and not much accustomed to it, will find that the book is an especially reliable guide because it goes so much into details and methods and tells exactly what is needed and how to do it.

—W. W. W.

NEW MEXICO NEWS NOTES

Doctor Arthur J. Evans of Fort Sumner has been appointed a member of the Medical Reserve Corps. Doctor Evans is a member of the Chavez County Medical Society.

Doctor David Twichell of Albuquerque has been appointed a member of the Medical Reserve Corps and commissioned with the rank of Captain. He is now on duty at Fort Bliss, Texas, as a special examiner.

Doctor E. S. Bullock, Captain in the Medical Reserve Corps is now stationed at Fort Bliss, Texas, in charge of the board examining recruits for tuberculosis. In this work he is assisted, among others, by First Lieutenant E. A. Duncan, also of Silver City.

Doctor Arnaud Kline, a member of the Bernalillo County Medical Society, has entered the military service.

The Bernalillo County Medical Society has voted that members who treat bona fide patients of those who enter the military service shall forward fifty percent of the fees collected from these patients to the absentee.

St. Joseph's Hospital, Albuquerque, has been doing good work in furnishing hospital facilities to the National Guard encamped near the city.

The annual meeting of the New Mexico Medical Society will be held at Las Cruces, October 4th, 5th, 6th, next.

THE MEDICAL HISTORY OF A STATE

In the memory of many old retired doctors are stored stories of pioneer days in Texas, Arizona and New Mexico, but these are never put on paper, the old physicians die, their household goods, books, papers, instruments are cleared by the second-hand dealer to make room for his successor, and a page of history is lost.

Two years ago I tried to gather together some medical biographical material, pictures, etc., and found that others were on the trail. Dr. John S. Turner, Dr. Theodore Windlandt, Dr. D. Alexander, Dr. M. Duggan, Dr. W. R. Tipton, Dr. E. J. Beall, Dr. J. D. Mitchell, Dr. Stout, were all interested, but had had no time. Some of these in their turn, are now dead, their researches undone, their reminiscences buried with them.

The Hon. Claude McCaleb, of Fort Worth, says he remembers when he lived 50 miles from a railroad and used to ride that distance for a doctor, generally getting him in time to tell what the man died of. He recalls the first operation he saw. "The old doctor was not a man who washed his hands

many times before operating, but did the operation and washed his hands after. Consultation was unusual, for the patient usually died before the second doctor was fetched." Dr. Daniel tells how, after the war, drugs were expensive and natural resources were tried, the people gathering willow bark, dewberry root, skullcap, etc. There was a good deal of malaria about and one patient was so thin that the dogs followed him about thinking he was a bone.

What I would suggest is that a State Medical Museum should be opened. A single room would suffice at first, and in it should be gathered old portraits of men and places, books (by men of the state), letters, instruments, and, as the place grew, perhaps a pathological room also.

The few glimpses I have been able to get of pioneer medical life in Texas, Arizona and New Mexico are convincing that time would prove the deep interest of such a museum to our coming generation of doctors.

The war has given a tremendous importance to the whole subject of diet. Food ranks almost with bullets as a vital factor in the great struggle, and efficient utilization of the crops is just as necessary as big harvests. The Carnegie Institute of Boston is to conduct a series of experiments this fall to demonstrate whether men and women cannot maintain their powers on a smaller ration than has hitherto been accepted as the minimum. The Battle Creek Sanitarium has just finished a metabolism experiment lasting forty-five days, with ten subjects. The object was to determine the effect of different diets on the chemical composition of the blood. The results have not yet been tabulated.

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